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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/627,611	07/28/2003	Hiroshi Watanabe	402721	4283

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EXAMINER

KAO, CHIH CHENG G

ART UNIT PAPER NUMBER

2882

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary

Application No.

10/627,611

Applicant(s)

WATANABE ET AL.

Examiner

Chih-Cheng Glen Kao

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-13 is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/28/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: (fig. 1, A', B', C', and D').

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

3. The specification is objected to because of the following informalities, which appear to be minor draft errors including drawing inconsistencies.

In the following format (location of objection; suggestion for correction), the following corrections may obviate their respective objections: (page 14, line 33, “absorbers 3”; replacing “3” with - -2- -), (page 19, line 21, “the X-ray absorbers 3”; replacing “3” with - -2- -), and (page 19, line 21, “no X-ray absorbers 3”; replacing “3” with - -2- -).

Appropriate correction is required.

Claim Objections

4. Claims 3, 4, 9, and 11-13 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following corrections may obviate their respective objections: (claim 3, lines 3-4, “and the method of fabricating”; inserting - -wherein- - after “and”), (claim 4, line 4, “and the method of fabricating”; inserting - -wherein- - after “and”), (claim 9, lines 2-3, “wherein forming said X-ray absorber includes: forming an X-ray transmitter”; replacing “absorber” with - -mask- -), (claim 11, line 3, “between the phase of X-rays”; replacing “the” with - -a- -), (claim 11, line 4, “and the phase of X-rays”; replacing “the” with - -a- -), (claim 11, lines 4-5, “of said X-ray in a range”; inserting - -mask- - after “X-ray”), (claim 11, line 12, “the phase shift”; replacing “the” with - -a- -), (claim 12, line 2, “on condition”; inserting - -a- - before “condition”), and (claim 13, line 2, “wherein absolute value”; inserting - -a- - after “wherein”).

For purposes of examination, the claims have been treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 5, 6, 7, 9, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoga et al. (US Patent Application 2001/0021239).

6. Regarding claim 1, Itoga et al. discloses a method comprising steps of forming an X-ray transmitter (fig. 14, #16), and forming a laminated X-ray absorber (fig. 14, #17a-18b) opposite said X-ray transmitter (fig. 14, #16), wherein said laminated X-ray absorber includes at least two layers having different compositions (fig. 14, #17a and 18a).

7. Regarding claims 5 and 6, Itoga et al. further discloses wherein said laminated X-ray absorber has a layer containing at least one substance selected from the group consisting of lithium, beryllium, boron, carbon (paragraph 434, line 4), sodium, magnesium, aluminum, silicon, phosphorus, sulfur, potassium, calcium, scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, gallium, germanium, arsenic, selenium, palladium, silver, cadmium, indium, tin, antimony, tellurium, cesium, barium, mixtures of these elements, a carbide including silicon carbide and tungsten carbide, a nitride including silicon nitride, aluminum nitride, and chromium nitride, an oxide including silicon oxide and chromium oxide, a fluoride, and an iodide.

8. Regarding claim 7, Itoga et al. discloses a method comprising steps of forming a removed portion (fig. 14, gaps above #16 in section #20) on an X-ray transmitter (fig. 14, #16), leaving a portion (fig. 14, #17a) other than said removed portion on said X-ray transmitter (fig. 14, #16), and forming an X-ray absorber (fig. 14, #18a) on said portion (fig. 14, #17a) other than said removed portion.

9. Regarding claims 9 and 10, Itoga et al. further discloses wherein forming said X-ray mask includes forming an X-ray transmitter (fig. 14, #16), forming a first X-ray absorber opposite (fig. 14, #17) said X-ray transmitter, and forming a second X-ray absorber (fig. 14, #18), different in pattern size from said first X-ray absorber (fig. 14, #17), on said first X-ray absorber, wherein the pattern size of said first X-ray absorber (fig. 14, #17) is larger than the pattern size of said second X-ray absorber (fig. 14, #18).

10. Claims 1 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Sentoku et al. (US Patent 5553110).

Sentoku et al. discloses a method comprising steps of forming an X-ray transmitter (fig. 13f, #162), and forming a laminated X-ray absorber (fig. 13f, #163-165) opposite said X-ray transmitter (fig. 13f, #162), wherein said laminated X-ray absorber includes at least two layers having different compositions (fig. 13f, #163-165), and wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 13f, #163) opposite said X-ray transmitter (fig. 13f, #162) and a second X-ray absorber (fig. 13f, #165) on said first X-ray absorber (fig. 13f, #163), and

wherein the method of fabricating an X-ray mask further comprises forming an interlayer film (fig. 13f, #164) as an etching stopper or a hard mask on said first X-ray absorber (fig. 13f, #163), and forming said second X-ray absorber (fig. 13f, #165) on said interlayer film (fig. 13f, #164).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoga et al. as applied to claim 1 above, and further in view of Lee et al. (US Patent 6534221).

Itoga et al. discloses a method as recited above. Itoga et al. further discloses wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 14, #17a) opposite said X-ray transmitter (fig. 14, #16) and a second X-ray absorber (fig. 14, #18a) in contact with said first X-ray absorber (fig. 14, #17a), tungsten (paragraph 437) is employed as one of said first X-ray absorber and said second X-ray absorber, and carbon (paragraph 434, line 4) is employed as the other of said first X-ray absorber and second X-ray absorber.

However, Itoga et al. does not specifically disclose diamond as an absorber.

Lee et al. teaches diamond as an absorber (col. 5, lines 8-9).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Itoga et al. with the diamond absorber of Lee et al., since one would be motivated to make such a modification for increasing the life of a

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device (col. 6, lines 29-31) as implied from Lee et al. Furthermore, it would have been obvious and within the general skill of a worker in the art to select a known material on the basis of its suitability.

12. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoga et al. as applied to claim 1 above, and further in view of Maehara et al. (US Patent 5870448).

Itoga et al. discloses a method as recited above. Itoga et al. further discloses wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 14, #17a) on said X-ray transmitter (fig. 14, #16) and a second X-ray absorber (fig. 14, #18a) on said first X-ray absorber.

However, Itoga et al. does not specifically disclose forming an etching stopper film, stopping etching when etching a first X-ray absorber on an X-ray transmitter, and forming a second X-ray absorber on said etching stopper film.

Maehara et al. teaches forming an etching stopper film (fig. 1f, #104a), stopping etching when etching a first X-ray absorber (fig. 1f, #105b) on an X-ray transmitter (figs. 1a and 1f, #102), and forming a second X-ray absorber (fig. 1f, #106b) on said etching stopper film (fig. 1f, #104a):

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Itoga et al. with the etching stopping film of Maehara et al., since one would be motivated to make such a modification for protecting the X-ray transmitter (figs. 1A-1L) as implied from Maehara et al.

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13. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoga et al. as applied to claim 7 above, and further in view of Zapka et al. (US Patent 4855197).

Itoga et al. discloses a method as recited above.

However, Itoga et al. does not specifically disclose implanting ions before forming a removed portion.

Zapka et al. teaches implanting ions before (col. 7, lines 15-22) forming a removed portion (fig. 2, #5).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Itoga et al. with the implantation of ions of Zapka et al., since one would be motivated to make such a modification for making a stronger mask (abstract, lines 4-7) as shown by Zapka et al.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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14. Claims 1, 2, 5, 6, 9, and 10 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of U.S. Patent No. 6898267 in view of Itoga et al.

15. Regarding claim 1, US Patent 6898267 claims an X-ray mask comprising an X-ray transmitter and an X-ray absorber including at least two different compositions (claims 1-3).

However, US Patent 6898267 does not claim a method of fabricating including steps of forming laminated absorber layers.

Itoga et al. teaches a method of fabricating including steps of forming laminated absorber layers (fig. 14).

It would be obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the claims of US Patent 6898267 with the method of Itoga et al. since one would be motivated to make such a modification to keep the mask simple and compact (fig. 14) as implied from Itoga et al.

16. Regarding claim 2, US Patent 6898267 further claims wherein tungsten is employed as one of a first X-ray absorber and said second X-ray absorber (claim 2), and diamond is employed as the other of said first X-ray absorber and said second X-ray absorber (claim 1).

17. Regarding claims 5 and 6, US Patent 6898267 further claims an absorber containing titanium (claim 3).

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18. Regarding claims 9 and 10, US Patent 6898267 further claims forming a second X-ray absorber, different in pattern size from a first X-ray absorber, wherein the pattern size of said first X-ray absorber is larger than the pattern size of said second X-ray absorber (claim 1).

Allowable Subject Matter

19. Claims 11-13 contain allowable subject matter. The following is a statement of reasons for the indication of allowable subject matter.

Regarding claim 11, prior art does not disclose or fairly suggest a method including carrying out an exposure with an X-ray mask having a geometric X-ray phase difference between a phase of X-rays transmitted through an X-ray transmission part of said X-ray mask and a phase of X-rays transmitted through an X-ray absorber of said X-ray mask in a range including 0.5π and in proximity to 0.5π , wherein a laminated structure includes at least two layers having different compositions, and either a phase shift of the X-rays transmitted through said X-ray absorber is in a range of 0.3π to 0.6π or the transmittance of the X-rays transmitted through said X-ray absorber is in a range of 30% to 60%, in combination with all the limitations in the claim. Claims 12 and 13 contain allowable subject matter by virtue of their dependency.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).

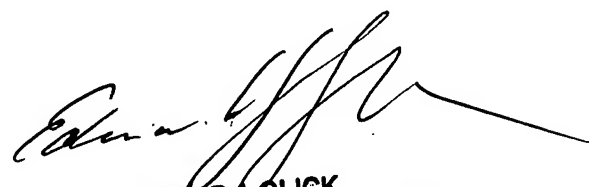
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



gk



EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER